

CHAPTER 1

HAZARDOUS WASTE IDENTIFICATION

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OVERVIEW

What is a hazardous waste? Simply defined, a **hazardous waste** is a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Unfortunately, in order to develop a regulatory framework capable of ensuring adequate protection, this simple narrative definition is not enough. Determining what is a hazardous waste is paramount, because only those wastes that have specific attributes are subject to Subtitle C regulation.

Making this determination is a complex task which is a central component of the hazardous waste management regulations. Hazardous waste is generated from many sources, ranging from industrial manufacturing process wastes, to batteries, to fluorescent light bulbs. Hazardous waste may come in many forms, including liquids, solids, gases, and sludges. To cover this wide range, EPA has developed a system to identify specific substances known to be hazardous and provide objective criteria for including other materials in this universe. Further complicating matters, the regulations contain guidelines for determining what exactly is a waste (called a solid waste) and what is excluded from the hazardous waste regulations, even though it otherwise is a solid and hazardous waste. Finally, to promote recycling and the reduction of the amount of waste entering the RCRA system, EPA provides exemptions for certain wastes when they are recycled in certain manners.

This chapter introduces the hazardous waste identification process, describes how to determine if a waste is a solid waste, and provides the regulatory definition for hazardous waste. It also discusses those wastes specifically excluded from Subtitle C regulation, and those wastes exempted when recycled.

HAZARDOUS WASTE IDENTIFICATION PROCESS

Proper hazardous waste identification is essential to the success of the RCRA program. This identification process can be a very complex task. Therefore, it is best to approach the issue by asking a series of questions in a step-wise manner (see Figure III-2). If facility owners and operators answer the following questions, they can determine if they are producing a hazardous waste:

1. Is the material in question a solid waste?

2. Is the material excluded from the definition of solid waste or hazardous waste?
3. Is the waste a listed hazardous waste? (Or, is the waste delisted?)
4. Is the waste a characteristic hazardous waste?

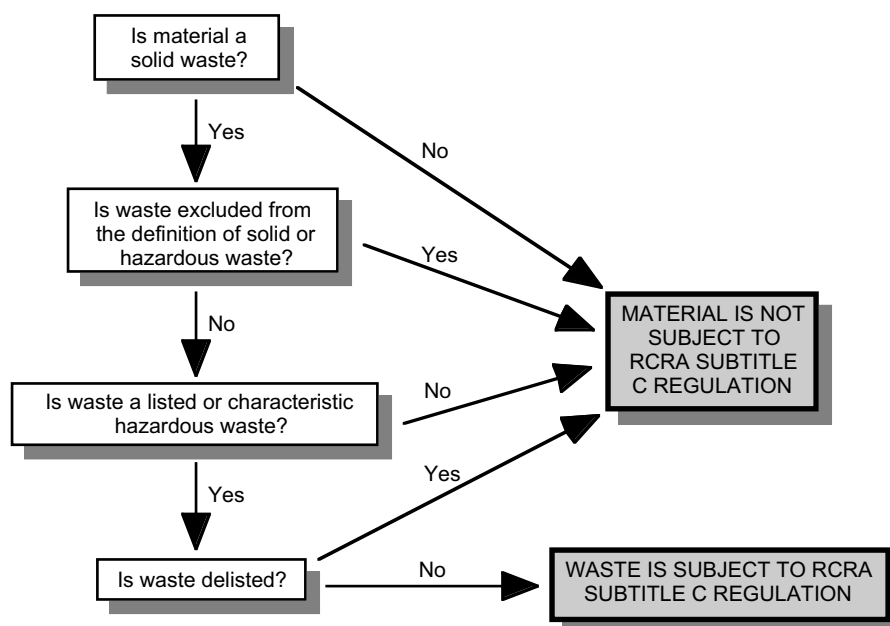
This chapter will examine these key questions.

IS THE MATERIAL A SOLID WASTE?

The Subtitle C program uses the term solid waste to denote something that is a waste. In order for a material to be classified as a hazardous waste, it must first be a solid waste. Therefore, the first step in the hazardous waste identification process is determining if a material is a solid waste.

The statutory definition points out that whether a material is a solid waste is not based on the physical form of the material (i.e., whether or not it is a solid as opposed to a liquid or gas), but rather that the material is a waste. The regulations

Figure III-2: HAZARDOUS WASTE IDENTIFICATION PROCESS



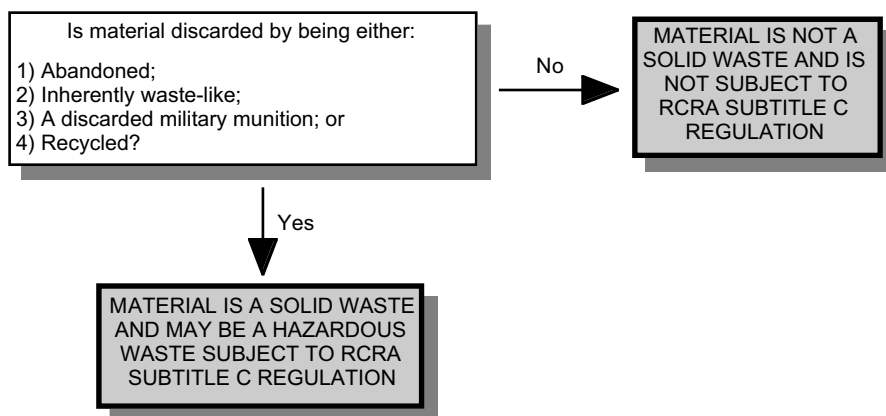
further define **solid waste** as any material that is discarded by being either abandoned, inherently waste-like, a certain military munition, or recycled (see Figure III-3).

- **Abandoned** — The term **abandoned** simply means thrown away. A material is abandoned if it is disposed of, burned, or incinerated.
- **Inherently Waste-Like** — Some materials pose such a threat to human health and the environment that they are always considered solid wastes; these materials are considered to be **inherently waste-like**. Examples of inherently waste-like materials include certain dioxin-containing wastes.
- **Military Munition** — **Military munitions** are all ammunition products and components produced for or used by the U.S. Department of Defense (DOD) or U.S. Armed Services for national defense and security. Unused or defective munitions are solid wastes when abandoned (i.e., disposed of, burned, incinerated) or treated prior to disposal; rendered nonrecyclable or nonuseable through deterioration; or declared a waste by an authorized military official. Used (i.e., fired or detonated) munitions may also be solid wastes if collected for storage, recycling, treatment, or disposal.
- **Recycled** — A material is **recycled** if it is used or reused (e.g., as an ingredient in a process), or reclaimed. A material is **reclaimed** if it is processed to recover a usable product (e.g., smelting a waste to recover valuable metal constituents), or if it is regenerated through processing to remove contaminants in a way that restores them to their useable condition (e.g., distilling dirty spent solvents to produce clean solvents). (Recycled materials are fully discussed in Section III, Chapter 2.)

■ Recycled Materials

Materials that are recycled are a special subset of the solid waste universe. When recycled, some materials are not solid wastes, and therefore, not hazardous wastes, while others are solid and hazardous waste, but are subject to less-stringent regulatory controls. The level of regulation that applies to recycled materials depends on the

Figure III-3: IS IT A SOLID WASTE?



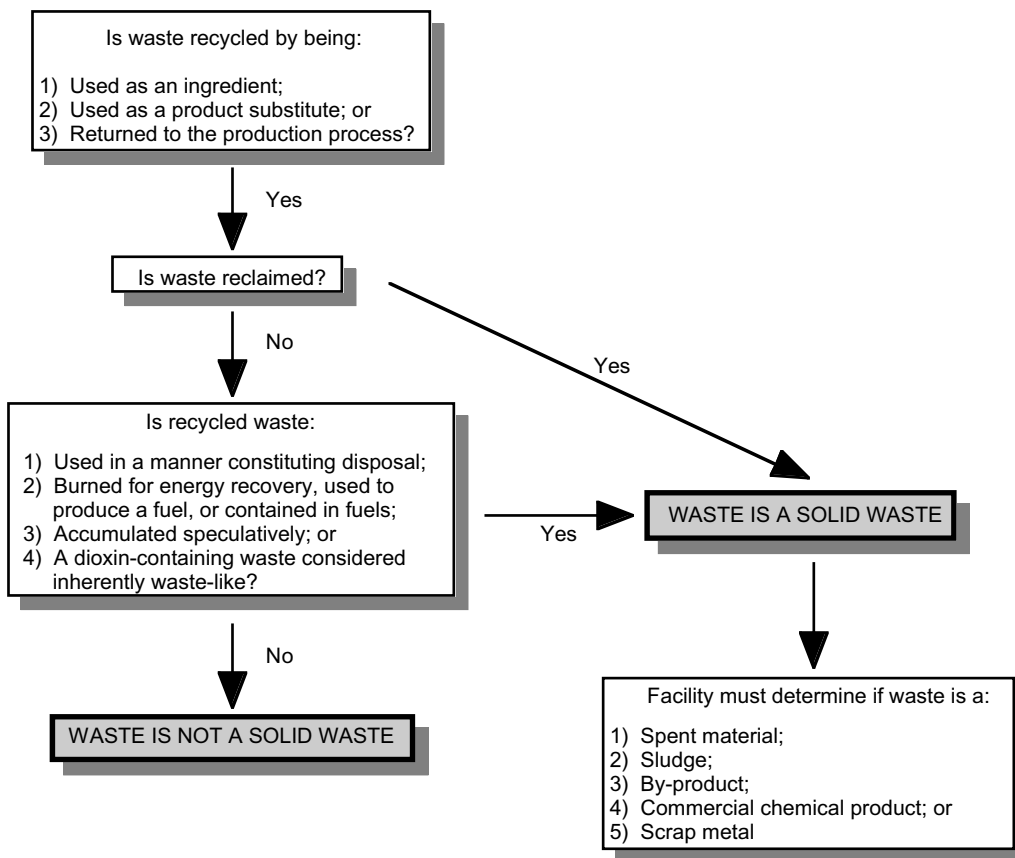
material and the type of recycling (see Figure III-4). Because some types of recycling pose threats to human health and the environment, RCRA does not exempt all recycled materials from the definition of solid waste. As a result, the manner in which a material is recycled will determine whether or not the material is a solid waste, and therefore potentially regulated as a hazardous waste. In order to encourage waste recycling, RCRA exempts three types of wastes from the definition of solid waste:

- **Wastes Used as an Ingredient** — If a material is directly used as an ingredient in a production process without first being reclaimed, then that material is not a solid waste.

- **Wastes Used as a Product Substitute** — If a material is directly used as an effective substitute for a commercial product (without first being reclaimed), it is exempt from the definition of solid waste.
- **Wastes Returned to the Production Process** — When a material is returned directly to the production process (without first being reclaimed) for use as a feedstock or raw material, it is not a solid waste.

Conversely, materials are solid wastes, and are not exempt, if they are recycled in certain ways. If these materials are used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; accumulated

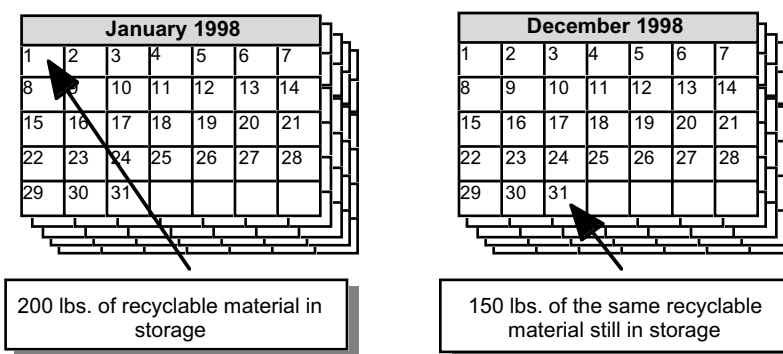
Figure III-4: ARE ALL RECYCLED WASTES SOLID WASTES?



speculatively; or dioxin-containing wastes considered inherently waste-like; then they are defined as solid wastes.

- **Used in a Manner Constituting Disposal** — **Use constituting disposal** is the direct placement of wastes or products containing wastes (e.g., asphalt with petroleum-refining wastes as an ingredient) on the land.
 - **Burned for Energy Recovery, Used to Produce a Fuel, or Contained in Fuels** — Burning hazardous waste for fuel (e.g., **burning for energy recovery**) and using wastes to produce fuels are regulated activities. Conversely, commercial products intended to be burned as fuels are not considered solid wastes. For example, off-specification jet fuel (e.g., a fuel with minor chemical impurities) is not a solid waste when it is burned for energy recovery, because it is itself a fuel.
 - **Accumulated Speculatively** — In order to encourage recycling of wastes as well as ensure that materials are actually recycled,
- and not simply stored to avoid regulation, EPA established a provision to encourage facilities to recycle sufficient amounts in a timely manner. This provision designates as solid wastes those materials that are **accumulated speculatively**. A material is accumulated speculatively (e.g., stored in lieu of expeditious recycling) if it has no viable market or if the person accumulating the material cannot demonstrate that at least 75 percent of the material is recycled in a calendar year, commencing on January 1 (see Figure III-5).
- **Dioxin-Containing Wastes Considered Inherently Waste-Like** — Dioxin-containing wastes are considered inherently waste-like because they pose significant threats to human health and the environment if released or mismanaged. As a result, RCRA does not exempt such wastes from the definition of solid waste even if they are recycled through direct use or reuse without prior reclamation. This is to ensure that such wastes are subject to the most protective regulatory controls.

Figure III-5: MATERIALS ACCUMULATED SPECULATIVELY



On January 1, 1998, a facility has 200 lbs. of a material that it wants to re-insert directly into its production process. Such a material is technically exempt from the definition of solid waste because it is being recycled through direct reuse without prior reclamation. However, by the end of the calendar year (December 31, 1998), less than 75 percent (i.e., less than 150 lbs.) of the material has been reclaimed or sent off site for reclamation. Therefore, the material has been speculatively accumulated and is no longer exempt from the definition of solid waste. The material may then be regulated as a hazardous waste.

■ Secondary Materials

Not all materials can be directly used or reused without reclamation. If such materials need to be reclaimed before use, they are generally regulated as solid wastes. However, some materials that must be reclaimed prior to use as a recyclable material may still be exempt from the definition of solid waste. This depends on the type of material that the waste is. In order to facilitate this solid waste determination process, EPA groups all materials into five categories. These **secondary materials** consist of spent materials, sludges, by-products, commercial chemical products (CCPs), and scrap metal.

Spent Materials

Spent materials are materials that have been used and can no longer serve the purpose for which they were produced without processing. For example, a solvent used to degrease metal parts will eventually become contaminated such that it cannot be used as a solvent until it is regenerated. If a spent material must be reclaimed, it is a solid waste and is subject to hazardous waste regulation. Spent materials are also regulated as solid wastes when used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively (see Figure III-6).

Figure III-6: REGULATORY STATUS OF SECONDARY MATERIALS

These materials are solid wastes when...				
	Reclaimed	Used in a manner constituting disposal	Burned for energy recovery, used to produce a fuel, or contained in fuels	Accumulated speculatively
Spent Materials	✓	✓	✓	✓
Listed Sludges	✓	✓	✓	✓
Characteristic Sludges		✓	✓	✓
Listed By-products	✓	✓	✓	✓
Characteristic By-products		✓	✓	✓
Commercial Chemical Products		✓ *	✓ *	
Scrap Metal	✓	✓	✓	✓
* If such management is consistent with the product's normal use, then commercial chemical products used in a manner constituting disposal or burned for energy recovery, used to produce a fuel, or contained in fuels are not solid wastes. ✓ Material is a solid waste				

Sludges

Sludges are any solid, semisolid, or liquid wastes generated from a wastewater treatment plant, water supply treatment plant, or air pollution control device (e.g., filters, baghouse dust). Sludges from specific industrial processes or sources (known as listed sludges) are solid wastes when reclaimed; used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively. On the other hand, characteristic sludges (which are sludges that exhibit certain physical or chemical properties) are not solid wastes when reclaimed, unless they are used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively (see Figure III-6). (Listings and characteristics are fully discussed later in this chapter.)

By-Products

By-products are materials that are not one of the intended products of a production process. An example is the sediment remaining at the bottom of a distillation column. By-product is a catch-all term and includes most wastes that are not spent materials or sludges. Listed by-products are solid wastes when reclaimed; used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively. On the other hand, characteristic by-products are not solid wastes when reclaimed, unless they are used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively (see Figure III-6).

Commercial Chemical Products

Commercial chemical products are unused or off-specification chemicals (e.g., chemicals that have exceeded their shelf life), spill or container

residues, and other unused manufactured products that are not typically considered chemicals. CCPs are not solid wastes when reclaimed, unless they are used in a manner constituting disposal; or burned for energy recovery, used to produce a fuel, or contained in fuels (see Figure III-6).

Scrap Metal

Scrap metal is worn or extra bits and pieces of metal parts, such as scrap piping and wire, or worn metal items, such as scrap automobile parts and radiators. If scrap metal must be reclaimed, it is a solid waste and is subject to hazardous waste regulation. Scrap metal is also regulated as a solid waste when used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively. This does not apply to processed scrap metal which is excluded from hazardous waste generation entirely (as discussed later in this chapter).

■ Sham Recycling

For all recycling activities, the above rules are based on the premise that legitimate reclamation or reuse is taking place. EPA rewards facilities recycling some wastes by exempting them from regulation, or by subjecting them to lesser regulation. Some facilities, however, may claim that they are recycling a material in order to avoid being subject to RCRA regulation, when in fact the activity is not legitimate recycling. EPA has established guidelines for what constitutes legitimate recycling and has described activities it considers to be illegitimate or **sham recycling**. Considerations in making this determination include whether the secondary material is effective for the claimed use, if the secondary material is used in excess of the amount necessary, and whether or not the facility has maintained records of the recycling transactions.

SHAM RECYCLING

Sham recycling may include situations when a secondary material is:

- Ineffective or only marginally effective for the claimed use (e.g., using certain heavy metal sludges in concrete when such sludges do not contribute any significant element to the concrete's properties)
- Used in excess of the amount necessary (e.g., using materials containing chlorine as an ingredient in a process requiring chlorine, but in excess of the required chlorine levels)
- Handled in a manner inconsistent with its use as a raw material or commercial product substitute (e.g., storing materials in a leaking surface impoundment as compared to a tank in good condition that is intended for storing raw materials).

- Exclusions for waste generated in raw material, product storage, or manufacturing units
- Exclusions for laboratory samples and waste treatability studies.

If the waste fits one of these categories, it is not regulated as a RCRA hazardous waste, and the hazardous waste requirements do not apply.

■ Solid Waste Exclusions

A material cannot be a hazardous waste if it does not meet the definition of a solid waste. Thus, wastes that are excluded from the definition of solid waste are not subject to RCRA Subtitle C hazardous waste regulation. There are 15 exclusions from the definition of solid waste.

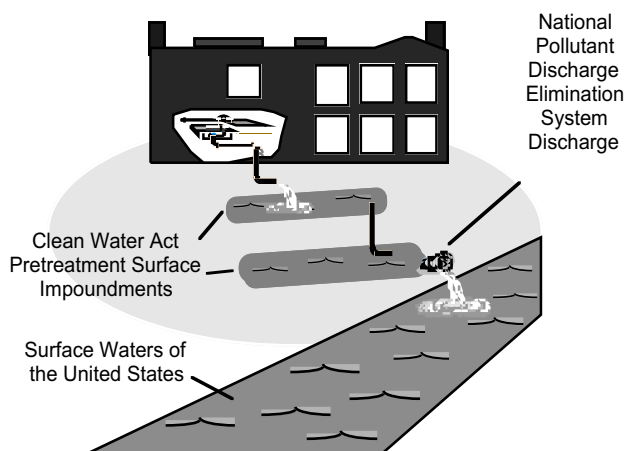
IS THE WASTE EXCLUDED?

Not all RCRA solid wastes qualify as hazardous wastes. Other factors must be considered before deciding whether a solid waste should be regulated as a hazardous waste. Regulation of certain wastes may be impractical or otherwise undesirable, regardless of the hazards that the waste might pose. For instance, household waste can contain dangerous chemicals, such as solvents and pesticides, but subjecting households to the strict RCRA waste management regulations would create a number of practical problems. As a result, Congress and EPA exempted or excluded certain wastes, such as household wastes, from the hazardous waste definition and regulations. Determining whether or not a waste is excluded or exempted from hazardous waste regulation is the second step in the RCRA hazardous waste identification process. There are four categories of exclusions:

- Exclusions from the definition of solid waste
- Exclusions from the definition of hazardous waste

Domestic Sewage and Mixtures of Domestic Sewage

Domestic sewage, or sanitary waste, comes from households, office buildings, factories, and any other place where people live and work. These wastes are carried by sewer to a municipal wastewater treatment plant (called a **publicly owned treatment works (POTW)**). The treatment of these wastes is regulated under the Clean Water Act (CWA). Mixtures of sanitary wastes and other wastes (including hazardous industrial wastes) that



pass through a sewer system to a POTW are also excluded from Subtitle C regulation once they enter the sewer.

Industrial Wastewater Discharges (Point Source Discharges)

Another exclusion from RCRA designed to avoid overlap with CWA regulations applies to **point source discharges**. Point source discharges are discharges of pollutants (e.g., from a pipe, sewer, or pond) directly into a lake, river, stream, or other water body. CWA regulates such discharges under the National Pollutant Discharge Elimination System (NPDES) permitting program. Under this exclusion from the definition of solid waste, wastewaters that are subject to CWA regulations are exempt from Subtitle C regulation at the point of discharge. Any hazardous waste generation, treatment, or storage prior to the discharge is subject to RCRA regulation. Many industrial facilities that treat wastewater on site utilize this point source discharge exclusion.

Irrigation Return Flows

When farmers irrigate agricultural land, water not absorbed into the ground can flow into reservoirs for reuse. This return flow often picks up pesticide or fertilizer constituents, potentially rendering it hazardous. Because this water may be reused on the fields, it is excluded from the definition of solid waste.

Radioactive Waste

Radioactive waste is regulated by either the Nuclear Regulatory Commission or the U.S. Department of Energy (DOE) under the Atomic Energy Act (AEA). To avoid duplicative regulation under RCRA and AEA,



RCRA excludes certain radioactive materials from the definition of solid waste. However, RCRA excludes only the radioactive components of the waste. If a radioactive waste is mixed with a hazardous waste, the resultant mixture is regulated by both AEA and RCRA as a **mixed waste**. Similarly, if a facility generates a hazardous waste that is also radioactive, the material is a mixed waste and is subject to regulation under both RCRA and AEA (the regulatory status of mixed waste is fully discussed later in this chapter).

In-Situ Mining Waste

In-situ (in-place) mining of certain minerals may involve the application of solvent solutions directly to a mineral deposit in the ground. The solvent passes through the ground, collecting the mineral as it moves. The mineral and solvent mixtures are then collected in underground wells where the solution is removed. Such solvent-contaminated earth, or any nonrecovered solvent, is excluded from the definition of solid waste when left in place.

Pulping Liquors

Pulping liquor, also called black liquor, is a corrosive material used to dissolve wood chips for manufacturing of paper and other materials. To promote waste minimization and recycling, EPA excluded pulping liquors from the definition of solid waste if they are reclaimed in a recovery furnace and then reused in the pulping process. If the liquors are recycled in another way, or are accumulated speculatively, they are not excluded.

Spent Sulfuric Acid

Spent sulfuric acid may be recycled to produce virgin sulfuric acid. To promote waste reduction and recycling, such recycled spent sulfuric acid is excluded from the definition of solid waste, unless the facility accumulates the material speculatively.

Closed-Loop Recycling

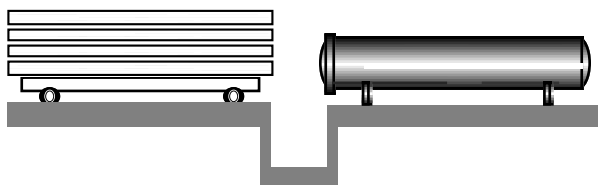
To further promote waste reduction and recycling, spent materials that are reclaimed and returned to the original process in an enclosed system of pipes and tanks are excluded from the definition of solid waste, provided that:

- Only tank storage is involved, and the entire process, through reclamation, is closed to the air (i.e., enclosed)
- Reclamation does not involve controlled flame combustion, such as that which occurs in boilers, industrial furnaces, or incinerators
- Waste materials are never accumulated in tanks for more than 12 months without being reclaimed
- Reclaimed materials are not used to produce a fuel, or used to produce products that are used in a manner constituting disposal.

An example of such a closed-loop system might include a closed solvent recovery system in which the dirty solvents are piped from the degreasing unit to a solvent still where the solvent is cleaned, and then piped back to the degreasing unit.

Spent Wood Preservatives

Many wood preserving plants recycle their wastewaters and spent wood preserving solutions. These materials are collected on drip pads and sumps, and are in many cases returned directly to the beginning of the wood preserving process where they are reused in the same manner. While the process resembles a closed-loop recycling



process, the closed-loop recycling exclusion does not apply because drip pads are open to the air. Consistent with their objective to encourage recycling hazardous waste, EPA developed two specific exclusions for spent wood preserving solutions and wastewaters containing spent preservatives, provided that the materials have been reclaimed and are reused for their original purpose. In addition, EPA proposed to exclude wood preserving solutions and wastewaters from the definition of solid waste prior to reclamation. In order to use this proposed exclusion, a facility would be required to reuse the materials for their intended purpose, and manage them in a way that prevented releases to the environment.

Coke By-Product Wastes

Coke, used in the production of iron, is made by heating coal in high temperature ovens. Throughout the production process many by-products are created. The refinement of these coke by-products generates several listed and characteristic wastestreams. However, to promote recycling of these wastes, EPA provided an exclusion from the definition of solid waste for certain coke by-product wastes that are recycled into new products.

Splash Condenser Dross Residue

The treatment of steel production pollution control sludge generates a zinc-laden residue, called a dross. This material, generated from a splash condenser in a high temperature metal recovery process, is known as a splash condenser dross residue. Because this material contains 50 to 60 percent zinc, it is often reclaimed, reused, or processed as a valuable recyclable material. Since facilities commonly handle this material as a valuable commodity by managing it in a way that is protective of human health and the environment, EPA excluded this residue from the definition of solid waste.

Recovered Oil From Petroleum Refining Operations

Petroleum refining facilities sometimes recover oil from oily wastewaters and reuse this oil in the refining process. In order to encourage waste minimization and recycling, EPA excluded such recovered oil from the definition of solid waste when it is returned to the refinery.

Comparable Fuels

In order to promote the recycling of materials with high fuel values, certain materials that are burned as fuels are excluded from the definition of solid waste, provided that they meet certain specifications (i.e., are of a certain degree of purity). This is to ensure that the material does not exceed certain levels of toxic constituents and physical properties that might impede burning. Materials that meet this specification are considered comparable to pure or virgin fuels.

Processed Scrap Metal

Scrap metal includes, but is not limited to, pipes, containers, equipment, wire, and other metal items that are no longer of use. To facilitate recycling, scrap metal that has been processed to make it easier to handle or transport and is sent for metals recovery is excluded from the definition of solid waste.

Shredded Circuit Boards

Circuit boards are metal boards that hold computer chips, thermostats, batteries, and other electronic components. Circuit boards can be found in computers, televisions, radios, and other electronic equipment. When this equipment is thrown away, these boards can be removed and recycled. Whole circuit boards meet the definition of scrap metal, and are therefore exempt from hazardous waste regulation when recycled (as discussed in Section III, Chapter 2).

On the other hand, some recycling processes involve shredding the board. Such shredded boards do not meet the exclusion for recycled scrap metal. In order to facilitate the recycling of such materials, EPA excluded recycled shredded circuit boards from the definition of solid waste, provided that they are stored in containers sufficient to prevent release to the environment, and are free of potentially dangerous components, such as mercury switches, mercury relays, nickel-cadmium batteries, and lithium batteries.

Hazardous Waste Exemptions

EPA also exempts certain solid wastes from the definition of hazardous waste. If a material meets an exemption from the definition of hazardous waste, it cannot be a hazardous waste, even if the material technically meets a listing or exhibits a characteristic. There are 13 exemptions from the definition of hazardous waste.



Household Hazardous Waste

Households often generate solid wastes that could technically be hazardous wastes (e.g., old solvents, paints, pesticides, fertilizer, poisons). However, it would be impossible to regulate every house in the United States that occasionally threw away a can of paint thinner or a bottle of rat poison. Therefore, EPA developed the household waste exemption. Under this exemption, wastes generated by normal household activities (e.g., routine house and yard maintenance) are exempt from the definition of hazardous waste. EPA has expanded the exemption to include household-like areas, such as bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas. While household hazardous waste is exempt from Subtitle C, it is regulated under Subtitle D as a solid waste (as discussed in Section II).

Agricultural Waste

To prevent overregulation of farms and promote waste recycling, solid wastes generated by crop or animal farming are excluded from the definition of hazardous waste provided that the wastes are returned to the ground as fertilizers or soil conditioners. Examples of such wastes are crop residues and manures.

Mining Overburden

After an area of a surface mine has been depleted, it is common practice to return to the mine the earth and rocks (overburden) that were removed to gain access to ore deposits. When the material is returned to the mine site, it is not a hazardous waste under RCRA.

Bevill and Bentsen Wastes

In the Solid Waste Disposal Act Amendments of 1980, Congress amended RCRA by exempting oil, gas, and geothermal exploration, development, and production wastes (**Bentsen wastes**); fossil fuel combustion wastes; mining and mineral processing wastes; and cement kiln dust wastes (**Bevill wastes**) from the definition of hazardous waste pending further study by EPA. These wastes were temporarily exempted because they were produced in very large volumes, were thought to pose less of a hazard than other wastes, and were generally not amenable to the management practices required under RCRA. The following paragraphs describe these exemptions in detail.

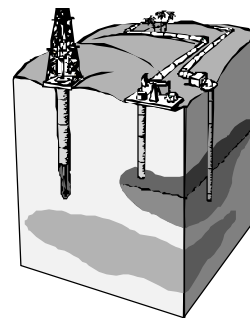
Fossil Fuel Combustion Waste

In order to accommodate effective study, fossil fuel combustion wastes were divided into two categories, large-volume coal-fired utility wastes and remaining wastes. After studying these wastes, in 1993, EPA decided to permanently exempt large-volume coal-fired utility wastes, including fly ash, bottom ash, boiler slag, and flue

gas emission control waste from the definition of hazardous waste. EPA continues to study the remaining wastes. Until a final determination is made, these wastes will remain exempt. The remaining waste category includes, but is not limited to, wastes from utilities burning other noncoal fossil fuels and wastes from nonutility boilers burning any type of fossil fuel.

Oil, Gas, and Geothermal Wastes

Certain wastes from the exploration and production of oil, gas, and geothermal energy are excluded from the definition of hazardous waste. These wastes include those that have been brought to the surface during oil and gas exploration and production operations, and other wastes that have come into contact with the oil and gas production stream (e.g., during removal of waters injected into the drill well to cool the drill bit).



Mining and Mineral Processing Wastes

Certain wastes from the mining, refining, and processing of ores and minerals are excluded from the definition of hazardous waste.

Cement Kiln Dust

Cement kiln dust is a fine-grained solid by-product generated during the cement manufacturing process and captured in a facility's air pollution control system. After study, EPA decided to develop specific regulatory provisions for cement kiln dust. Until EPA promulgates these new regulatory controls, however, cement kiln dust will generally remain exempt from the definition of hazardous waste.

Trivalent Chromium Wastes

The element chromium exists in two forms, hexavalent and trivalent. EPA determined that while hexavalent chromium poses enough of a threat to merit regulation as a characteristic hazardous waste, trivalent chromium does not. Therefore, to prevent unnecessary regulation, EPA excluded, from the definition of hazardous waste, trivalent chromium-bearing hazardous wastes from certain leather tanning, shoe manufacturing, and leather manufacturing industries.

Arsenically Treated Wood

Discarded arsenically treated wood or wood products that are hazardous only because they exhibit certain toxic characteristics (e.g., contain harmful concentrations of metal or pesticide constituents), are excluded from the definition of hazardous waste. Once such treated wood is used, it may be disposed of by the user (commercial or residential) without being subject to hazardous waste regulation. This exclusion is based on the fact that the risks posed by the use of such wood products on the land is identical to those posed by the wood's disposal. For example, arsenically treated telephone poles that are used as products on the land pose risks similar to the disposal of such poles. This exclusion applies only to end-users and not to manufacturers.

Petroleum-Contaminated Media and Debris from Underground Storage Tanks

USTs are used to store petroleum (e.g., oil) and hazardous substances (e.g., ammonia). When these tanks leak, the UST program under RCRA Subtitle I provides requirements for cleaning up such spills (the regulatory requirements for USTs are fully discussed in Section IV). To facilitate the corrective action process under the UST regulations, contaminated media (soils and ground water) and debris (tanks and equipment) at sites undergoing UST cleanup that are hazardous only

because they exhibit certain toxic characteristics (e.g., contain a harmful concentrations of leachable organic constituents) are excluded from the definition of hazardous waste.

Spent Chlorofluorocarbon Refrigerants

Chlorofluorocarbons (CFCs) released to the atmosphere damage the stratospheric ozone layer. To promote recycling and discourage the practice of venting used CFCs to the atmosphere as a means of avoiding Subtitle C regulation, EPA excluded recycled CFCs from the definition of hazardous waste since the refrigerants are generally reclaimed for reuse.

Used Oil Filters

In order to promote the recycling and recovery of metals and other products from used oil filters, EPA exempted used oil filters that have been properly drained to remove the used oil.



Used Oil Distillation Bottoms

When used oil is recycled, residues (called **distillation bottoms**) form at the bottom of the recycling unit. To promote used oil recycling and the beneficial reuse of waste materials, EPA excluded these residues from the definition of hazardous waste when the bottoms are used as ingredients in asphalt paving and roofing materials.

■ Raw Material, Product Storage, and Process Unit Waste Exclusions

Hazardous wastes generated in raw material, product storage, or process (e.g., manufacturing) units are exempt from Subtitle C hazardous waste regulation while the waste remains in such units. These units include tanks, pipelines, vehicles, and vessels used either in the manufacturing process or

for storing raw materials or products, but specifically do not include surface impoundments. Once the waste is removed from the unit, or when a unit temporarily or permanently ceases operation for 90 days, the waste is considered generated and is subject to regulation.

■ Sample and Treatability Study Exclusions

Hazardous waste samples are small, discrete amounts of hazardous waste that are essential to ensure accurate characterization and proper hazardous waste treatment. In order to facilitate the analysis of these materials, RCRA exempts characterization samples and treatability study samples from Subtitle C hazardous waste regulation.

Waste Characterization Samples

Samples sent to a lab to determine whether or not a waste is hazardous are exempt from regulation. Such samples (typically less than one gallon of waste) are excluded from Subtitle C regulation, provided that these samples are collected and shipped for the sole purpose of determining hazardous waste characteristics or composition. Storage, transportation, and testing of the sample are excluded from RCRA regulation even when the lab testing is complete, provided the sample is returned to the generator, and other specific provisions are met. When shipping the sample to or from the laboratory, the sample collector must comply with certain labeling requirements, as well as any applicable U.S. Postal Service (USPS) or U.S. Department of Transportation (DOT) shipping requirements.

Treatability Study Samples

To determine if a particular treatment method will be effective on a given waste or what types of wastes remain after the treatment is complete,

facilities send samples of waste to a lab for testing. EPA conditionally exempts those who generate or collect samples for the sole purpose of conducting treatability studies from the hazardous waste regulations, provided that certain requirements, including packaging, labeling, and recordkeeping provisions, are met. In addition, under specific conditions, laboratories conducting such treatability studies may also be exempt from Subtitle C regulation.

IS THE WASTE A LISTED HAZARDOUS WASTE?

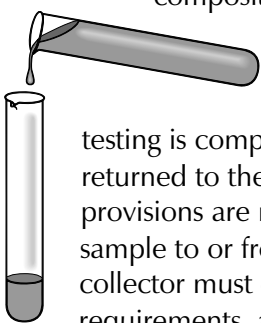
After a facility determines that its waste is a solid waste and is not either excluded from the definitions of solid or hazardous waste or exempt from Subtitle C hazardous waste regulation, the owner and operator must determine if the waste is a hazardous waste. The first step in this process is determining if the waste is a listed hazardous waste. The hazardous waste listings consist of four lists:

- The F list
- The P list
- The K list
- The U list.

Listed wastes are wastes from generic industrial processes, wastes from certain sectors of industry, and unused pure chemical products and formulations. Because these wastes are dangerous enough to warrant full Subtitle C regulation based on their origin, any waste fitting a narrative listing description is considered a listed hazardous waste.

■ Listing Criteria

Before developing each hazardous waste listing, EPA thoroughly studies a particular wastestream and the threats that it can pose to human health and the environment. If the waste poses enough of a threat, EPA includes a precise description of that waste on one of four hazardous waste lists within the regulations.



In order to determine whether a waste should be listed in the first place, the Agency developed a set of criteria to use as a guide and a consistent frame of reference when considering listing a wastestream. EPA only uses these criteria when evaluating whether to list a waste, as these listing criteria cannot be used by waste handlers for waste identification purposes. Waste handlers must instead consult the actual listings to determine if their waste is regulated as a listed hazardous waste.

There are four different criteria EPA uses to decide whether or not to list a waste as hazardous. Note that these four criteria do not directly correspond to the four different lists of hazardous waste. The four criteria are:

- The waste typically contains harmful chemicals (and other factors, such as risk and bioaccumulation potential) which indicate that it could pose a threat to human health and the environment in the absence of special regulation. Such wastes are known as toxic listed wastes.
- The waste contains such dangerous chemicals that it could pose a threat to human health and the environment even when properly managed. These wastes are fatal to humans and animals even in low doses. Such wastes are known as acute hazardous wastes.
- The waste typically exhibits one of the four characteristics of hazardous waste: ignitability, corrosivity, reactivity, and toxicity.
- EPA has cause to believe that, for some other reason, the waste typically fits within the statutory definition of hazardous waste developed by Congress.

DEFINITION OF HAZARDOUS WASTE

In RCRA §1004(5), Congress defined hazardous waste as a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

- (a) Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
- (b) Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Based on this broad definition, Congress instructed EPA to develop more specific criteria for defining solid and hazardous waste. Congress believed that EPA should define hazardous waste using two different mechanisms: by listing certain specific solid wastes as hazardous (i.e., wastes from certain industrial processes or sources), and by identifying characteristics (i.e., physical or chemical properties) which, when exhibited by a solid waste, make it hazardous. Taking Congress' lead, EPA proceeded to develop an elaborate definition of hazardous waste that included both of these mechanisms.

■ Hazardous Waste Listings

EPA has applied the listing criteria to hundreds of specific industrial wastestreams. These wastes are grouped into the four lists located at 40 CFR Part 261, Subpart D. Listed wastes are organized as follows:

- The F list — The F list includes wastes from certain common industrial and manufacturing processes. Because the processes generating these wastes can occur in different sectors of industry, the F list wastes are known as wastes from nonspecific sources. The F list is codified in the regulations at 40 CFR §261.31.

HAZARD CODES

To indicate its reason for listing a waste, EPA assigns a hazard code to each waste listed on the F, K, P, and U lists. The last four hazard codes in the table below apply to wastes that have been listed because they typically exhibit one of the four regulatory characteristics of hazardous waste. The first two hazard codes apply to listed wastes whose constituents pose additional threats to human health and the environment. The hazard codes indicating the basis for listing a waste are:

Toxic Waste	(T)
Acute Hazardous Waste	(H)
Ignitable Waste	(I)
Corrosive Waste	(C)
Reactive Waste	(R)
Toxicity Characteristic Waste	(E)

The hazard codes assigned to listed wastes affect the regulations that apply to handling the waste. For instance, acute hazardous wastes accompanied by the hazard code (H) are subject to stricter management standards than most other wastes.

- The K list — The K list includes wastes from specific industries. As a result, K list wastes are known as wastes from specific sources. The K list is found at 40 CFR §261.32.
- The P list and the U list — These two lists include pure or commercial grade formulations of specific unused chemicals. Chemicals are included on the P list if they are acutely toxic. A chemical is acutely toxic if it is fatal to humans in low doses, if scientific studies have shown that it has lethal effects on experimental organisms, or if it causes serious irreversible or incapacitating illness. The U list is generally comprised of chemicals that are toxic, but also includes chemicals that display other characteristics, such as ignitability or reactivity. Both the P list and U list are codified at 40 CFR §261.33.

Each list includes anywhere from 30 to a few hundred listed hazardous wastestreams. All of the wastes on these lists are assigned an identification number (i.e., a waste code) consisting of the letter

associated with the list (i.e., F, K, P, or U) followed by three numbers. For example, wastes on the F list may be assigned a waste code ranging from F001 to F039, while wastes on the K list may be assigned a waste code ranging from K001 to K161. These waste codes are an important part of the RCRA regulatory system since waste code assignment has important implications for the future management standards that will apply to the waste.

The F List: Wastes From Nonspecific Sources

The F list designates hazardous wastes from common industrial and manufacturing processes. F list wastes usually consist of chemicals that have been used for their intended purpose in an industrial process. The F list wastes can be divided into seven groups, depending on the type of manufacturing or industrial operation that creates them:

- Spent solvent wastes (waste codes F001 through F005)
- Electroplating and other metal finishing wastes (F006 through F012 and F019)
- Dioxin-bearing wastes (F020 through F023 and F026 through F028)
- Chlorinated aliphatic hydrocarbons production wastes (F024 and F025)
- Wood preserving wastes (F032, F034, and F035)
- Petroleum refinery wastewater treatment sludges (F037 and F038)
- Multisource leachate (F039).

Spent Solvent Wastes

The spent solvent waste listings (F001 through F005) apply to wastestreams that are generated from the use of certain common organic solvents.

Solvents are commonly used in various industries, such as mechanical repair, dry cleaning, and electronics manufacturing, for degreasing and cleaning in addition to other functions. While solvents are chemicals with many uses, these listings only apply to solvents that are used as solvents for their solvent properties (e.g., to solubilize, dissolve, or mobilize other constituents) and are spent (e.g., cannot be used further without reprocessing). In addition, these listings only apply to solvents that contain one or more of the specific organic solvent constituents found in the F001-F005 narrative descriptions. Lastly, these listings only cover solvents that were above a certain concentration before use.

Electroplating and Other Metal Finishing Wastes

The electroplating and other metal finishing waste listings (F006 through F012 and F019) apply to wastestreams that are commonly produced during electroplating and other metal finishing operations. Diverse industries use electroplating and other methods to change the surface of metal objects in order to enhance the appearance of the objects, make them more resistant to corrosion, or impart some other desirable property to them. Industries involved in plating and metal finishing range from jewelry manufacture to automobile production.

Dioxin-Bearing Wastes

The dioxin-bearing waste listings (F020 through F023 and F026 through F028) describe a number of wastestreams that EPA believes are likely to contain dioxins, which are allegedly among the most dangerous known chemical compounds. The dioxin listings apply primarily to manufacturing process wastes from the production of specific pesticides or specific chemicals used in the production of pesticides. With the exception of F028, all of the dioxin-bearing wastes are considered acutely hazardous wastes and are

designated with the hazard code (H). These wastes are therefore subject to stricter management standards than other hazardous wastes.

Chlorinated Aliphatic Hydrocarbon Production Wastes

The chlorinated aliphatic hydrocarbons production wastes (F024 and F025) list certain wastestreams produced by the manufacture of chlorinated aliphatic hydrocarbons. Chlorinated aliphatic hydrocarbons are used in the manufacture of certain pesticides and fire retardants.

Wood Preserving Wastes

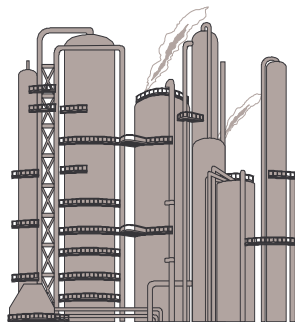
The wood preserving waste listings (F032, F034, and F035) apply to certain wastes from wood preserving operations. Most wood used for construction or other nonfuel applications is chemically treated to slow the deterioration caused by decay and insects. For example, telephone poles, railroad cross ties, and other wood products are treated to withstand the rigors of outdoor use.

Wood preservation typically involves coating lumber with pentachlorophenol, creosote, or preservatives containing arsenic or chromium. The wood preserving process creates wastestreams containing these chemicals, such as excess preservative solution that drips from wood products after treatment. Waste from wood preservation using pentachlorophenol is F032, waste from use of creosote is F034, and waste from treating wood with arsenic or chromium is F035.

These listings (as well as some K list waste listings) also apply to a variety of other residues from wood preserving.

Petroleum Refinery Wastewater Treatment Sludges

The petroleum refinery wastewater treatment sludge listings (F037 and F038) apply to specific wastestreams from petroleum refineries. The petroleum refining process typically creates large quantities of contaminated wastewater. Before this wastewater can be discharged to a river or sewer, it must be treated to remove oil, solid material, and chemical pollutants.



To remove most of this oily waste from the wastewater, refineries typically use two methods. In the first step, gravity separates the pollutants from the wastewater. The solids and heavier pollutants sink to the bottom of a tank, forming a sludge, while the lighter materials (called **float**) float to the surface of the wastewater, where they can be skimmed off. This sludge is F037. The second step uses physical (stirring or agitating) and chemical means to separate remaining pollutants from the wastewater into sludge and float. This sludge and float are F038.

Multisource Leachate

The F039 listing applies to multisource leachate, the liquid material that accumulates at the bottom of a hazardous waste landfill. The leachate that percolates through landfills, particularly hazardous waste landfills, usually contains high concentrations of chemicals, and is often collected to minimize the potential for it to enter and contaminate the soil or ground water below the unit.

The K List: Wastes From Specific Sources

The K list designates hazardous wastes from specific sectors of industry and manufacturing. Like F list wastes, K list wastes are manufacturing process wastes, and usually consist of chemicals that have been used for their intended purpose.

To determine whether a waste qualifies as K-listed, a facility must first determine whether the waste fits within one of the 17 different industrial or manufacturing categories on the list. Second, a facility must determine if this waste matches one of the detailed K list waste descriptions in 40 CFR §261.32. The 17 industries that generate K list wastes are:

- Wood preservation
- Organic chemicals manufacturing
- Pesticides manufacturing
- Petroleum refining
- Primary copper production
- Primary zinc production
- Ferroalloys production
- Veterinary pharmaceuticals manufacturing
- Inorganic pigment manufacturing
- Inorganic chemicals manufacturing
- Explosives manufacturing
- Iron and steel production
- Primary lead production
- Primary aluminum production
- Secondary lead processing
- Ink formulation
- Coking (processing of coal to produce coke, a material used in iron and steel production).

The P and U Lists: Discarded Commercial Chemical Products

The P and U lists designate as hazardous waste pure and commercial grade formulations of certain unused chemicals that are being disposed. Unused chemicals may become wastes for a number of reasons. For example, some unused chemicals are spilled by accident. Others are intentionally discarded because they are off-specification and cannot serve the purpose for which they were originally produced. For a waste to qualify as P- or U-listed, the waste must meet the following three criteria:

- The waste must contain one of the chemicals listed on the P or U list
- The chemical in the waste must be unused
- The chemical in the waste must be in the form of a CCP.

For purposes of the P and U lists, a CCP is defined as a chemical that is one of the following:

- 100 percent pure
- Technical (e.g., commercial) grade
- The sole active ingredient in a chemical formulation.

While 100 percent pure means that the chemical is the only chemical constituent in the product, **technical grade** means that the formulation is not 100 percent pure, but is of a grade of purity that is either marketed or recognized in general usage by the chemical industry. **Sole active ingredient** means that the chemical is the only ingredient serving the function of the formulation. For instance, a pesticide made for killing insects may contain a poison such as heptachlor, as well as various solvent ingredients which act as carriers or lend other desirable properties to the poison. Although

all of these chemicals may be capable of killing insects, only the heptachlor serves the primary purpose of the insecticide product. The other chemicals involved are present for other reasons, not because they are poisonous. Therefore, heptachlor is the sole active ingredient in such a formulation even though it may be present in low concentrations.

■ **Delistings**

The RCRA regulations provide a form of relief for listed wastes with low concentrations of hazardous constituents. Through a site-specific process known as **delisting**, a waste handler can submit to an EPA Region or state a petition demonstrating that even though a particular wastestream generated at its facility is a listed hazardous waste, it does not pose sufficient hazard to merit RCRA regulation. For example, a waste generated at a specific facility may meet a listing description even though the process uses different raw materials than EPA assumed were used when listing the waste, thus the waste may not contain the contaminants for which it was listed. Similarly, after treatment of a listed waste, the residue may no longer pose a threat to human health and the environment.

Specifically, the petition must demonstrate that the waste does not:

- Meet the criteria for which it was listed
- Exhibit any hazardous waste characteristics (as discussed later in this chapter)
- Pose a threat to human health and the environment by being hazardous for any other reason (e.g., does not contain additional constituents that could pose a threat).

If the EPA Region or state grants a delisting petition, the particular wastestream at that facility will not be regulated as a listed hazardous waste.

IS THE WASTE A CHARACTERISTIC HAZARDOUS WASTE?

After a facility determines its waste is a solid waste and is not excluded from the definitions of solid or hazardous waste, it must determine if the waste is a hazardous waste. This entails determining if the waste is listed, and also if the waste is characteristic. Even if a waste is a listed hazardous waste, the facility must then still determine if the waste exhibits a characteristic.

Characteristic wastes are wastes that exhibit measurable properties which indicate that a waste poses enough of a threat to deserve regulation as hazardous waste. EPA tried to identify characteristics which, when present in a waste, can cause death or illness in humans or lead to ecological damage. The characteristics are an essential supplement to the hazardous waste listings. For example, some wastes may not meet any listing description because they do not originate from specific industrial or process sources, but the waste may still pose threats to

human health and the environment. As a result, a facility is also required to determine whether such a waste possesses a hazardous property (i.e., exhibits a hazardous waste characteristic). The characteristics are applied to any waste from any industry.

Even if a waste does meet a hazardous waste listing description, the facility must still determine if the waste exhibits a characteristic. If such listed wastes do exhibit a characteristic, the waste poses an additional hazard to human health and the environment, and may necessitate additional regulatory precautions. For example, wastes that are both listed and characteristic may have more extensive LDR requirements, than those that are only listed (the LDR program is fully discussed in Section III, Chapter 6).

EPA decided that the characteristics of hazardous waste should be detectable by using a standardized test method or by applying general knowledge of the waste's properties. Given these criteria, EPA established four hazardous waste characteristics:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity.

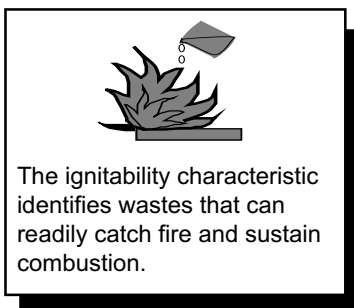
■ Ignitability

The **ignitability characteristic** identifies wastes that can readily catch fire and sustain combustion. Many paints, cleaners, and other industrial wastes pose such a hazard. Liquid and nonliquid wastes are treated differently by the ignitability characteristic.

DETERMINING BOTH LISTINGS AND CHARACTERISTICS

A facility must determine both listings and characteristics. Even if a waste is a listed hazardous waste, the facility must then still determine if the waste exhibits a characteristic because waste generators are required to fully characterize their listings. While some wastes may not meet any listing description because they do not originate from specific industrial or process sources, the waste may still pose threats to human health and the environment. As a result, a facility is also required to determine whether such a waste possesses a hazardous property (i.e., exhibits a hazardous waste characteristic).

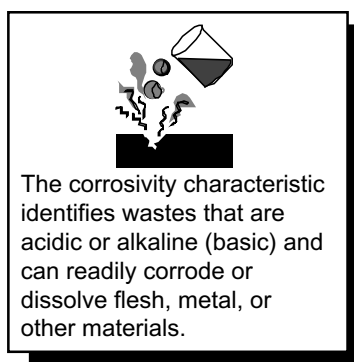
Most ignitable wastes are liquid in physical form. EPA selected a flash point test as the method for determining whether a liquid waste is combustible enough to deserve regulation as hazardous. The flash point test determines the lowest temperature at which the fumes above a waste will ignite when exposed to flame.



Many wastes in solid or nonliquid physical form (e.g., wood, paper) can also readily catch fire and sustain combustion, but EPA did not intend to regulate most of these nonliquid materials as ignitable wastes. A nonliquid waste is considered ignitable if it can spontaneously catch fire or catch fire through friction or absorption of moisture under normal handling conditions and can burn so vigorously that it creates a hazard. Certain compressed gases are also classified as ignitable. Finally, substances meeting the Department of Transportation's definition of oxidizer are classified as ignitable wastes. Ignitable wastes carry the waste code D001 and are among the most common hazardous wastes. The regulations describing the characteristic of ignitability are codified at 40 CFR §261.21.

■ Corrosivity

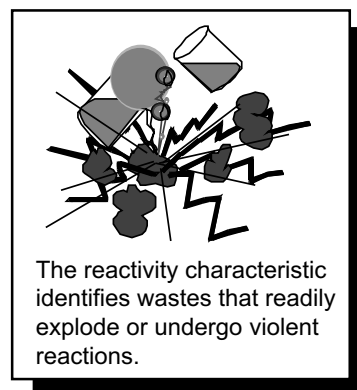
The **corrosivity characteristic** identifies wastes that are acidic or alkaline (basic). Such wastes can readily corrode or dissolve flesh, metal, or other



materials. They are also among the most common hazardous wastes. An example is waste sulfuric acid from automotive batteries. EPA uses two criteria to identify liquid and aqueous corrosive hazardous wastes. The first is a pH test. Aqueous wastes with a pH greater than or equal to 12.5 or less than or equal to 2 are corrosive. A liquid waste may also be corrosive if it has the ability to corrode steel under specific conditions. Physically solid, nonaqueous wastes are not evaluated for corrosivity. Corrosive wastes carry the waste code D002. The regulations describing the corrosivity characteristic are found at 40 CFR §261.22.

■ Reactivity

The **reactivity characteristic** identifies wastes that readily explode or undergo violent reactions. Common examples are discarded



munitions or explosives. In many cases, there is no reliable test method to evaluate a waste's potential to explode or react violently under common handling conditions. Therefore, EPA uses narrative criteria to define most reactive wastes and requires waste handlers to use their best judgment in determining if a waste is sufficiently reactive to be regulated. This is possible because reactive hazardous wastes are relatively uncommon and the dangers that they pose are believed to be well known to the few waste handlers who deal with them.

A waste is reactive if it meets any of the following criteria:

- It can explode or violently react when exposed to water or under normal handling conditions

- It can create toxic fumes or gases when exposed to water or under normal handling conditions
- It meets the criteria for classification as an explosive under DOT rules
- It generates toxic levels of sulfide or cyanide gas when exposed to a pH range of 2 through 12.5.

Wastes exhibiting the characteristic of reactivity are assigned the waste code D003. The reactivity characteristic is described in the regulations at 40 CFR §261.23.

■ Toxicity

When hazardous waste is disposed of in a land disposal unit, toxic compounds or elements can leach into underground drinking water supplies and expose users of the water to hazardous chemicals and constituents. EPA developed the **toxicity characteristic (TC)** to identify wastes likely to leach dangerous concentrations of toxic chemicals into ground water.

In order to predict whether any particular waste is likely to leach chemicals into ground water at dangerous levels, EPA designed a lab procedure to replicate the leaching process and other conditions that occur when wastes are buried in a typical municipal landfill. This lab procedure is known as the **Toxicity Characteristic Leaching Procedure (TCLP)**.

The regulations require a facility to apply the TCLP to its hazardous waste samples in order to create a liquid leachate. This leachate would be similar to the leachate generated by a landfill containing a mixture of household and industrial wastes. Once this leachate is created via the TCLP, the waste handler must determine whether

it contains any of 40 different toxic chemicals in amounts above the specified regulatory levels (see Figure III-7). These regulatory levels are based on ground water modeling studies and toxicity data that calculate the limit above which these common toxic compounds and elements will threaten human health and the environment. If the leachate sample contains a concentration above the regulatory limit for one of the specified chemicals, the waste exhibits the toxicity characteristic and carries the waste code associated with that compound or element. The regulations describing the toxicity characteristic

Figure III-7: TCLP REGULATORY LEVELS

Waste Code	Contaminant	Concentration
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	o-Cresol*	200.0
D024	m-Cresol*	200.0
D025	p-Cresol*	200.0
D026	Total Cresols*	200.0
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D012	Endrin	0.02
D031	Heptachlor (and its epoxide)	0.008
D032	Hexachlorobenzene	0.1
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethylene	0.7
D015	Toxaphene	0.5
D040	Trichloroethylene	0.5
D041	2,4,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP (Silvex)	1.0
D043	Vinyl chloride	0.2

*if o-, m-, and p-cresols cannot be individually measured, the regulatory level for total cresols is used.

are codified at 40 CFR §261.24, and the TC regulatory levels appear in Table 2 of that same section.

SPECIAL REGULATORY CONVENTIONS

Once a facility generates a hazardous waste, the waste may become mixed with other wastes, be treated and produce residues, or even be spilled. RCRA provides special regulatory provisions to address the regulatory status of hazardous wastes in these situations.

■ Mixture Rule

The **mixture rule** is intended to ensure that mixtures of listed wastes with nonhazardous solid wastes are regulated in a manner that minimizes threats to human health and the environment.

Listed Wastes

The mixture rule regulates a combination of any amount of a nonhazardous solid waste and any amount of a listed hazardous waste as a listed hazardous waste (see Figure III-8). Even if a small vial of listed waste is mixed with a large quantity of nonhazardous waste, the resulting mixture bears the same waste code and regulatory status as the original listed component of the mixture, unless the generator obtains a delisting. This is intended to prevent a facility from mixing a listed waste with a nonhazardous waste in order to escape having to manage the waste as hazardous.

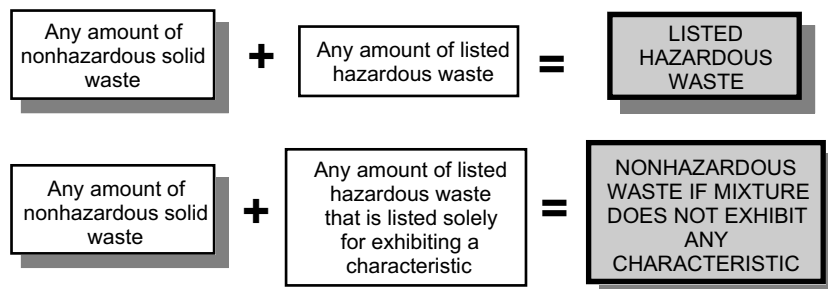
Exemptions

There are several exemptions from the mixture rule. One exemption from the mixture rule

applies to mixtures of solid wastes and wastes listed solely because they exhibit a characteristic (see Figure III-8). When EPA lists a waste as hazardous, the Agency assigns a hazard code to the waste as a reason for the listing. If a hazardous waste is listed for ignitability (hazard code I), corrosivity (hazard code C), or reactivity (hazard code R), and that waste is mixed with a solid waste, then the original listing does not carry through to the resulting mixture as long as that mixture does not exhibit any hazardous waste characteristics. The reason behind this exemption is that the such wastes were originally listed for the risks posed by certain characteristics, and if a waste mixture does not exhibit those characteristics (e.g., it does not pose a significant risk), then the mixture does not warrant Subtitle C regulation. For example, EPA listed the F003 spent solvents as hazardous because these wastes typically display the ignitability characteristic. If F003 waste is inadvertently mixing with another waste, and the resulting mixture does not exhibit any characteristic, the F003 listing no longer applies.

Another exemption from the mixture rule applies to certain listed hazardous wastes that are discharged to wastewater treatment facilities in very small or **de minimis** amounts. Many industrial facilities produce large quantities of nonhazardous wastewaters as their primary wastestreams. These wastewaters are typically discharged to a water body or local sewer system after being treated to remove pollutants, as

Figure III-8: THE MIXTURE RULE



required by CWA. At many of these large facilities, on-site cleaning, chemical spills, or laboratory operations create relatively small amounts of hazardous waste. For example, a textile plant producing large quantities of nonhazardous wastewater can generate a secondary wastestream of listed spent solvents from cleaning equipment. Routing such secondary hazardous wastestreams to the facility's wastewater treatment system is a practical way of treating and disposing of these wastes. This management option triggers the mixture rule, since even a very small amount of a listed wastestream combined with very large volumes of nonhazardous wastewater causes the entire mixture to be listed. EPA provided an exemption from the mixture rule for situations where relatively small quantities of listed hazardous wastes are routed to large-volume wastewater treatment systems.

Other exemptions apply to mixtures of listed and characteristic wastes with mining and mineral processing that are exempt from the definition of hazardous waste under the Bevill exemption. Wastes that are hazardous via the mixture rule can also exit Subtitle C regulation through the delisting process.

■ Derived-From Rule

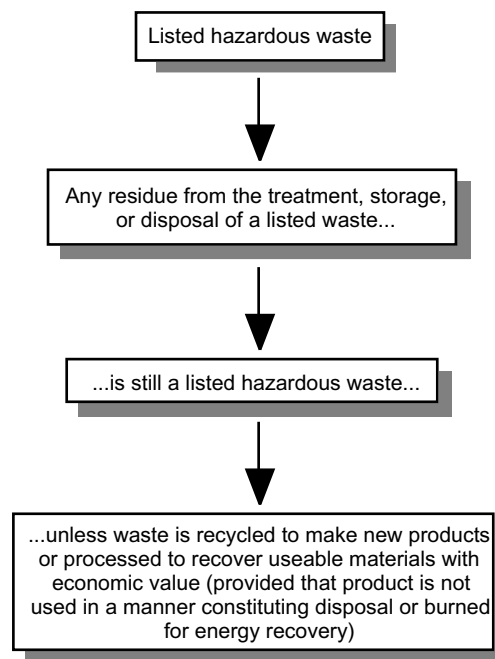
Hazardous waste treatment, storage, and disposal processes often generate residues that may contain high concentrations of hazardous constituents. In order to adequately protect human health and the environment from the threats posed by these potentially harmful wastes, the **derived-from rule** governs the regulatory status of such listed waste residues.

Listed Wastes

Residues produced from the treatment of listed hazardous wastes may pose a significant threat to human health and the environment. If

not captured by the waste's listing description, such waste could escape regulation. To close this potential regulatory gap, EPA created the derived-from rule which states that any material derived from a listed hazardous waste is also a listed hazardous waste (see Figure III-9). For example, ash created by burning a hazardous waste is considered derived-from that hazardous waste. Thus, such ash bears the same waste code and regulatory status as the original listed waste, regardless of the ash's actual properties. This principle applies regardless of the actual health threat posed by the waste residue or the residue's chemical composition.

Figure III-9: THE DERIVED-FROM RULE



Exemptions

There are several regulatory exemptions from the derived-from rule. The first exemption applies to products reclaimed from hazardous wastes. Many listed hazardous wastes can be recycled to make new products or processed to recover usable materials with economic value. Such

products derived-from recycled hazardous wastes are no longer solid wastes, provided that they are not used in a manner constituting disposal or burned for energy recovery (see Figure III-9). The other exemptions from the derived-from rule apply to residues from specific treatment operations. Wastes that are hazardous via the derived-from rule can also exit Subtitle C regulation through the delisting process.

■ Contained-In Policy

Sometimes listed and characteristic wastes are spilled onto soil or contaminate equipment, buildings, or other structures. The mixture and derived-from rules do not apply to such contaminated soil and materials because these materials are not actually wastes. Soil is considered **environmental media** (e.g., soil, ground water, sediment), while the equipment, buildings, and structures are considered debris (e.g., a broad category of larger manufactured and naturally occurring objects that are commonly discarded). Examples of **debris** include:

- Dismantled construction materials, such as used bricks, wood beams, and chunks of concrete
- Decommissioned industrial equipment, such as pipes, pumps, and dismantled tanks
- Other discarded manufactured objects, such as personal protective equipment (e.g., gloves, coveralls, eyewear)
- Large, naturally occurring objects, such as tree trunks and boulders.

Environmental media and debris are contaminated with hazardous waste in a number of ways. Environmental media become contaminated through accidental spills of hazardous waste or spills of product chemicals which, when spilled, become hazardous wastes.

Debris can also be contaminated through spills. Most debris in the form of industrial equipment and personal protective gear becomes contaminated with waste or product chemicals during normal industrial operations.

In order to address such contaminated media and debris, EPA created the **contained-in policy** to determine when contaminated media and debris must be managed as RCRA hazardous wastes.

Environmental media are not, in and of themselves, waste, but are regulated as hazardous waste when they contain (are contaminated by) a RCRA listed hazardous waste or exhibit a characteristic. In these cases, the media and debris must be managed as if they were hazardous waste. EPA or states can determine that media and debris no longer contain hazardous waste by determining that the media or debris no longer poses a sufficient health threat to deserve RCRA regulation. Once this contained-out determination is made, the media and debris are generally no longer regulated under RCRA Subtitle C. However, under certain circumstances, the RCRA LDR requirements might continue to apply.

HAZARDOUS WASTE IDENTIFICATION RULES

RCRA regulates hazardous wastes either because they carry a listing code, or because they exhibit a characteristic. Characteristics are based on actual risks that the materials may pose. Listings codes however, can remain with a waste even if it has very low concentrations of harmful materials, or is considerably different from the waste for which the listing was originally created. RCRA listing codes often apply to hazardous waste mixtures; treatment, storage, and disposal residues; and contaminated media and debris

based on the source of the waste rather than the risks that such materials pose to human health and the environment.

In these situations, it is entirely possible that the mixtures, residues, or media and debris contain low concentrations of hazardous constituents, posing minimal threats to human health and the environment, but are still regulated as hazardous. Similarly, listed wastes may also contain low concentrations of hazardous constituents, but will still be regulated as hazardous because they originate from a specific industrial source or process. In order to add flexibility to the hazardous waste identification system, EPA proposed two hazardous waste identification rules to establish and provide a regulatory mechanism through which low-risk wastes can exit Subtitle C regulation.

The proposed **Hazardous Waste Identification Rule for Waste (HWIR-waste)** proposes exit levels for each of the hazardous constituents in listed wastes. If a facility can determine that the concentrations of hazardous constituents in the waste are below the exit levels, then the waste will no longer carry a listing, and will no longer be hazardous (provided it does not exhibit a characteristic). In essence, listed wastes with low concentrations of hazardous constituents, hazardous waste mixtures, and hazardous residues that do not pose significant risks will be able to exit Subtitle C regulation as long as they do not pose a threat to human health or the environment. EPA plans to write a new HWIR-waste proposal by October 31, 1999, and finalize the HWIR-waste rule by April 30, 2001.

The **Hazardous Waste Identification Rule for Contaminated Media (HWIR-media)** was proposed in April 1996, and requested public comment on several ways to improve regulations on the management of remediation wastes, such

as contaminated media, debris, and old sludges from hazardous waste cleanups. EPA had hoped to make comprehensive changes to the regulation of these remediation wastes, but public comments were extremely divided on the course of proper reform. Therefore, the Agency is planning to finalize, in June 1998, a few of the elements of the April 1996 proposal, but not to promulgate a comprehensive reform. EPA plans to finalize provisions for streamlined permits for managing remediation wastes, increased flexibility for staging wastes prior to off-site management, an exclusion for certain dredged material, and streamlined RCRA state authorization procedures. As part of a separate rulemaking, LDR Phase IV, EPA finalized new LDR treatment standards for hazardous soils. (LDR is fully discussed in Section III, Chapter 6.)

MIXED WASTE

RCRA specifically exempts certain radioactive mixed materials from the definition of solid waste. However, some radioactive material may be mixed with hazardous wastes that are regulated under RCRA. In addition, a facility may generate a hazardous waste that is also radioactive. Because the material in both of these situations contains both radioactive material and RCRA hazardous waste, it is referred to as mixed waste under RCRA. RCRA and AEA regulate these mixed wastes jointly. AEA regulates the RCRA-exempt radioactive portion and RCRA regulates the hazardous waste portion. Mixed waste generators include DOE, power plants, labs, hospitals, and universities using radioactive materials.



SUMMARY

In order to determine if a facility is subject to RCRA Subtitle C, the owner and operator must determine if they have a hazardous waste. This determination must be made by using the following methodology:

- Is the material a solid waste?
- Is the waste excluded?
- Is the waste a listed hazardous waste?
- Is the waste a characteristic waste?

A waste must first be a solid waste before it can be a hazardous waste. A solid waste is a waste that is abandoned, inherently waste-like, a certain military munition, or recycled. On the other hand, if a solid waste is directly recycled without prior reclamation by being either used as an ingredient, used as a product substitute, or returned to the production process, then the material is not regulated as a waste at all. If such recycled materials, however, are used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; accumulated speculatively; or dioxin-containing wastes considered inherently waste like; then they are regulated as solid wastes. If a recycled material needs reclamation prior to direct use or reuse, its regulatory status is determined by the type of material that it is:

- Spent materials are regulated as solid wastes when reclaimed; used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively.
- Listed sludges are solid wastes when reclaimed; used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively.

- Characteristic sludges are not solid wastes when reclaimed, unless they are used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively.
- Listed by-products are solid wastes when reclaimed; used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively.
- Characteristic by-products are not solid wastes when reclaimed, unless they are used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively.
- CCPs are not solid wastes when reclaimed, unless they are used in a manner constituting disposal; or burned for energy recovery, used to produce a fuel, or contained in fuels.
- Scrap metal is a solid waste when reclaimed; used in a manner constituting disposal; burned for energy recovery, used to produce a fuel, or contained in fuels; or accumulated speculatively.

Regardless of the type of recycling that takes place, it must be legitimate and not sham recycling.

If the waste is a solid waste, it may be excluded from the Subtitle C hazardous waste regulations. There are four categories of exclusions:

- Exclusions from the definition of solid waste
- Exemptions from the definition of hazardous waste
- Exclusions for waste generated in raw material, product storage, or manufacturing units

- Exclusions for laboratory samples and waste treatability studies.

If the waste fits one of these categories, it is not regulated as a RCRA hazardous waste, and the hazardous waste requirements do not apply.

If the waste is a solid waste and is not excluded, a facility must determine if it is a listed hazardous waste. The F, K, P, and U lists provide narrative descriptions of wastes from specific industrial processes and sources. Wastes meeting any of these descriptions are listed hazardous wastes. However, through the delisting process, facilities can demonstrate that their wastes does not pose sufficient hazard to warrant Subtitle C regulation as a listed hazardous waste.

Wastes may also be hazardous if they exhibit a characteristic. Even if a facility's waste is listed, the owner and operator must still determine if it exhibits a characteristic. The four characteristics are:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity.

There are special regulatory conventions or provisions that apply to hazardous waste mixtures; treatment, storage, and disposal residues; and contaminated media and debris. These provisions are known as the mixture rule, the derived-from rule, and the contained-in policy.

In the future, low-risk wastes with low concentrations of hazardous constituents will be able to exit Subtitle C regulation through risk-based exit levels established by HWIR-waste. Through HWIR-media, EPA will also facilitate the management of remediation wastes, such as contaminated media, debris, and old sludges from hazardous waste cleanups.

RCRA and AEA jointly regulate mixed waste, or waste that is radioactive, and listed or characteristic.